

BIOLOGICAL EVALUATION OF PINE BARK BEETLES ON THE ANDREW PICKENS RANGER DISTRICT, SUMTER NATIONAL FOREST

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ABSTRACT

An aerial survey, covering 128,000 acres, and ground check indicate that southern pine beetle (SPB) (Dendroctonus frontalis Zimm.) activity is increasing on the Andrew Pickens Ranger District, Sumter National Forest, in South Carolina. Twenty-four spots were located within the District boundaries, and 20 of these were on Forest Service land. Susceptible host type covers 46,566 acres (.43 spots per thousand acres of host type).

INTRODUCTION

An aerial survey of the Andrew Pickens Ranger District was conducted on August 30, 1982 by personnel from the Forest Pest Management Aerial Survey Team (Bassett, 1982). Twenty-four spots were located within the District purchase boundaries. Twenty of these spots were on Forest Service land.

There have been three SPB epidemics on the Andrew Pickens Ranger District in the past 20 years (Hoffard and Ghent, 1979). In 1963, SPB populations began to increase and peaked in 1965. Southern pine beetle epidemics usually collapse very fast, and this one followed that pattern when it collapsed in 1966. Southern pine beetle populations remained low until 1970, when they started building up again. This epidemic peaked in 1972. It took two years for this population to collapse. In 1979, the SPB had once more increased to outbreak levels. The following year, activity had virtually collapsed.

This evaluation was conducted to determine the present status and trend of SPB populations on the Andrew Pickens Ranger District. Personnel from Forest Pest Management, Asheville Field Office and District personnel conducted the evaluation on October 12-14, 1982.

METHODS

Standard, sketch mapping procedures were used in the aerial survey. Two observers each viewed a strip .5 mile wide. The flight lines were spaced 1 mile apart, resulting in a 100 percent survey. Spots of fading and/or red trees and the estimated number of trees per spot were recorded and plotted on Class A Forest Service maps of the District.

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Ten spots were selected to be ground checked. Only three of the aerially detected spots could be located, and these were sampled. The other seven spots sampled were new spots which either were not detected during the survey or had only recently become infested. Since the ground survey was done six weeks after the aerial survey, and the population was expanding, new spots could have become infested during that time. The map in Figure 1 shows the location of the spots which were sampled and the actual number of trees found in each spot. At each spot, the causal agent(s) was identified, and the number of infested and vacated trees by crown color (green, fading, red, or black), diameter and height of the first 20 trees, basal area, and average age were recorded.

RESULTS

The aerial detection survey located 24 multiple tree spots within the District boundary. Twenty of these were on Forest Service land, and four were on private land. Table 1 shows the distribution of spots by ownership and spot size category. The Andrew Pickens District has 46,566 acres of pine forest, which converts to .43 SPB spots per thousand acres of host type.

The results of the ground check are given in Table 2. Most of the spots have very low green:red tree ratios, which indicates that the spots are not expanding very rapidly. Usually, spot growth does slow down considerably in the fall, and instead, spot proliferation occurs. The beetles tend to disperse at this time of year and initiate new attacks. These would then show up as new spots next spring.

Another factor which slows spot growth is stand composition. The Andrew Pickens' forest is largely mixed pines and hardwoods. In many cases, a SPB spot grew until it ran out of host type. Spot expansion was then curtailed.

One of the spots ground checked was extremely large and contained only infested trees. This spot is expanding rapidly (green:red ratio of 2.4:1). In fact, this spot probably encompasses five aerially detected spots which have expanded into one another to form one large spot. The six weeks between aerial survey and ground check certainly would have been sufficient time for this to occur. It is expected that this spot will stop expanding, in at least one direction, as it moves toward an adjacent hardwood stand and runs out of pine type.

The volume of timber killed by SPB in the sampled spots totals 38,046 ft³ (Figure 2). Sixty-three percent of the volume killed is currently infested by SPB (green infested timber). This usually indicates very active SPB populations. However, almost the entire amount of green infested timber is contained in sample spot number 3. Indeed, the population in this spot is growing very fast, but this is not characteristic of the situation in the other spots sampled. In most of the spots, SPB activity is very low at this time.

The criteria used to determine whether an area qualifies for special suppression project funds include the number of SPB spots per 1,000 acres of susceptible host type and the green infested:red infested tree ratio. One multiple tree spot per 1,000 acres of susceptible host type historically has indicated the lower threshold of a SPB epidemic. The green:red tree ratio indicates how fast the SPB spot is expanding. Therefore, these two measures

Figure 1.--Location of sampled spots on the Andrew Pickens Ranger District.
Sumter National Forest.

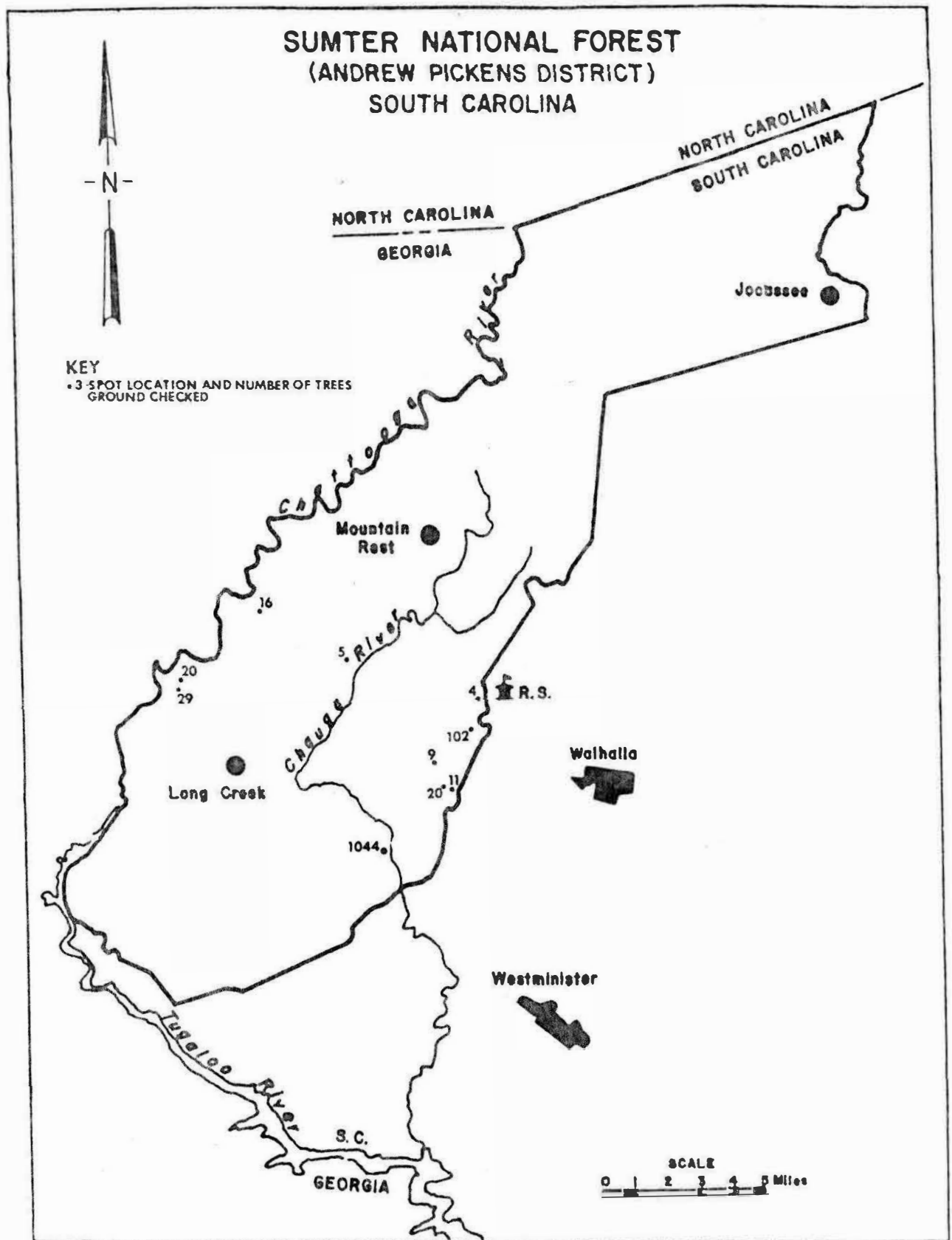


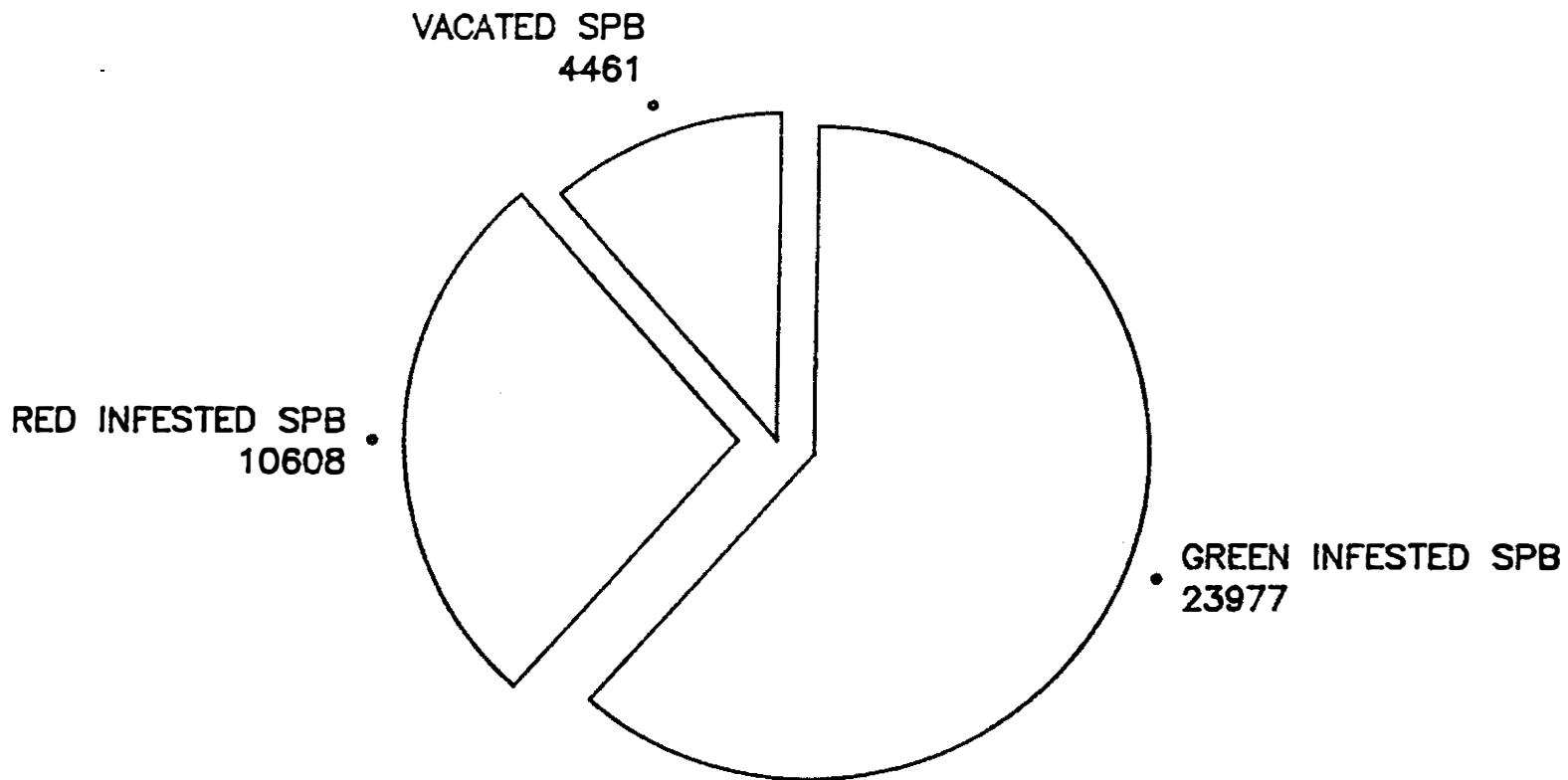
Table 1.--Summary of aerial survey data, Andrew Pickens Ranger District, Sumter National Forest, August 30, 1982.

	Infestation Size (# trees)				Total
	3-5	6-20	21-50	50+	
Ownership	# Spots	# Spots	# Spots	# Spots	# Spots
Forest Service	5	8	5	2	20
Private	2	1	1	0	4
Total	7	9	6	2	24

Table 2.--Summary of ground check data for the Andrew Pickens Ranger District, Sumter National Forest, October 1982.

Spot #	Aerial Size (# trees)	# of vacated trees				# of infested trees			% Infested	Green:Red Ratio	Basal Area	\bar{x} dbh/ \bar{x} ht	\bar{x} vol.
		Green	Red	Black	Total	Green	Red	Total					
1	SPB BTB	0	20	0	20	0	0	0	0	-	110	10/54	11.5
2	SPB IPS BTB	0	0	0	0	10	1	11	100	10:1	120	12.5/63	21
3	SPB IPS	0	0	0	0	737	307	1044	100	2.4:1	120	13.9/70	32
4	SPB IPS BTB	0	10	0	10	1	9	10	50	.11:1	110	13/67	26
5	SPB IPS BTB	0	19	0	19	1	9	10	34.5	.11:1	110	13/64	25
6	SPB IPS	0	16	0	16	0	10	10	38.5	-	100	9.9/46	10
7	SPB IPS BTB	0	64	30	94	2	6	8	7.8	.33:1	120	14.5/66	31
8	SPB	0	5	0	5	0	0	0	0	-	100	13.2/68	28
9	SPB BTB	0	5	2	7	1	1	2	22.2	1:1	110	11.5/59	18
10	SPB	0	3	0	3	1	0	1	25.0	-	90	16.5/80	52

FIG. 2 — — SAMPLED AFFECTED TIMBER BY
CONDITION (CUBIC FEET) , 10/14/82



SUMTER NATIONAL FOREST
ANDREW PICKENS DISTRICT

are used, along with economic evaluations, to justify special project funding. The level of SPB activity shown by this evaluation on the Andrew Pickens District is insufficient to justify a special suppression project. However, it appears very likely that SPB populations may continue to increase next year. Therefore, Forest Pest Management will conduct another aerial survey and biological evaluation in the spring or early summer of 1983.

We do recommend that spots are cut for salvage as soon as possible to prevent them from expanding. A buffer strip of green uninfested trees should be cut at the active head of the infestation. If a buffer strip is not cut, the chance of spot "breakout" is increased.

Trees in SPB spots which are no longer active--those containing only red or black-topped trees from which beetles have already emerged--should not be cut. These trees most likely contain predators and parasites of SPB. By leaving these trees, the natural enemies of the beetle are able to complete their life cycles.

For a complete discussion of recommended controls and preventive measures, please refer to the following sections.

CURRENT SUPPRESSION PROCEDURES

1. Removal of Infested Trees by Commercial Sale. When infested trees of merchantable size are accessible, they should be removed by commercial sale. Logging of the infested material should begin immediately. Contract time limits should insure rapid removal.

When practical, and if host type is present, a 40- to 70-foot buffer strip should be marked and cut adjacent to and ahead of the most recently infested trees. This practice is effective in reducing the possibility of "breakouts." When only a small volume of infested, merchantable material occurs in a spot, noninfested trees surrounding the spot may be marked to provide an operable cut.

The order of priority of removing beetle-infested timber from a spot should be as follows:

- Trees in the buffer zone at the head(s) of the spot; if not removed within two weeks of marking, another visit and tally must be made in order to insure removal of all infested trees and an adequate buffer strip.
- Trees with fresh attacks and having young broods (usually the green, recently infested trees).
- Trees having nearly developed broods (usually the red and fading trees).

Remove infested trees from National Forest lands by commercial sale or administrative procedures in accordance with guidelines and procedures set forth in FSM 2400 through 2490.

2. Piling and Burning. Unmerchantable or inaccessible SPB infestations can be suppressed by cutting, piling, and thoroughly burning the bark of infested trees. The entire bark surface must be thoroughly burned to insure effective control. The order of priority for cutting, piling, and burning infested trees, particularly the large spots, is the same as paragraph (1) under "Removal of Infested Trees by Commercial Sale." Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts," every effort should be made to locate and treat all green infested trees during the piling and burning operation.

3. Chemical Control. One chemical formulation recommended for SPB control is a one-half percent Lindane spray, with water as the carrier. This may be formulated from a 20 percent Lindane emulsifiable concentrate at the rate of 11 pints of concentrate in enough water to make 55 gallons of spray. (Ratio of one part 20 percent Lindane EC to 39 parts water.)

Dursban® (Chlorpyrifos) is also registered for SPB control. It is available as a liquid, containing 4 pounds of insecticide per gallon of concentrate. The spray is prepared by mixing 2-2/3 fluid ounces of concentrate with water to make 1 gallon or 2.1 gallons of concentrate in 100 gallons of water. Dursban®, a restricted-use pesticide, is to be applied only by or under the supervision of a certified pest control operator or other trained personnel responsible for insect control programs.

Cut, limb, and buck all infested trees into workable lengths. Spray the infested bark surface to the point of runoff. A compressed air sprayer (3-gallon capacity or equivalent) is an ideal applicator. Infested logs must be turned two or three times to insure complete treatment of infested bark. Spray stumps and bark removed by woodpeckers. Low pressure sprayers may be used to treat large, accessible infestations.

The order of priority for cutting and spraying infested trees in large spots is the same as paragraph (1) under "Removal of Infested Trees by Commercial Sale." Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts," every effort should be made to locate and treat all green infested trees during the chemical control operation.

Never spray trees from which SPB brood has emerged. Natural enemies of the SPB in these trees can then complete their development.

Instructions for minimizing the adverse effects of mixing, transporting, and storing pesticides; applying pesticides; and disposing of pesticide containers and excess chemicals are outlined in Section 8.3 of the Forest Service Health and Safety Code FSM 5242.21.

4. Cut-and-leave. This control tactic reduces losses from spot growth and proliferation during the summer months. Cut-and-leave is designed to disrupt spot growth in small- to medium-sized spots (40 active trees) by dispersing emerging beetles. These spots can be salvaged when markets or weather permit. Trees are still suitable for sale months after felling.

The following procedure is to be followed when using cut-and-leave:

(1) Identify all active trees within the spot.

- (2) Fell all active trees toward the center of the spot.
- (3) Fell a horseshoe-shaped buffer of green uninfested trees around the most recently attacked trees at the head of the spot and leave them lying on the ground with crowns pointed toward the center of the spot. The buffer should be as wide as the average height of the trees in the stand.

Cut-and-leave treatments should only be applied during the summer months between June and October. Spots with 10 or more infested trees should be treated first. As time permits, spots with less than 10 infested trees should also be treated, if they contain trees with fresh attacks. In these smaller infestations where a specific head is not distinguishable, an adequate buffer strip (equivalent to the average height of the stand) and all infested and green uninfested trees within the spot should be felled.

Re-examination of Treated Areas. Re-examine areas where infested trees were removed by commercial sales, piled and burned, chemically treated, or cut and left within 2 or 3 weeks after treatment to check for additional infested trees. If additional trees are found, treat them.

In any area where infested trees are cut for chemical control or piling and burning, or removed through commercial sales and administrative use procedures, stumps adjacent to living pine trees should be treated to control or prevent the root rot Fomes annosus.

In stands that have been previously thinned or have had a history of F. annosus infection, the stumps should be treated with the competing fungus, Phlebia gigantea.

In stands that have no history of F. annosus and have never been thinned, the stumps should be treated with borax.

Southern pine beetle-infested tree stumps cut during the period of May through August, and below 34°N latitude, do not have to be treated with either of the above materials. This is because few spores are formed during this period and high temperatures often kill spores that are produced. However, routine summer thinning in areas of SPB buildup is not recommended.

PREVENTIVE MEASURES

The preceding represents only short term, immediate control strategies. Preventive measures form an important part of the integrated pest management process. Some of the more significant preventive measures include:

1. Preventing or minimizing littleleaf disease, a condition which predisposes these weakened trees to beetle attack. Depending on severity of infection, diseased trees may be removed during normal thinnings on a 6-year cutting cycle or as soon as merchantable. In high-hazard areas or when replanting known littleleaf sites, use loblolly pine or a more resistant tree species, as opposed to shortleaf pine.

2. Harvesting mature and overmature stands. Such stands are vulnerable to beetle attack and should be harvested as soon as possible.
3. Thinning stagnated stands. Overstocked stands are low in vigor and are more likely to be attacked. They should be thinned to a point that trees again show thrift and vigor.
4. Minimizing impact of natural disturbances which causes stand stress. These factors include ice, wind, hail, animal damage, flooding, erosion, poor soil fertility, etc. Corrective measures include removal of individually damaged trees, wholesale salvage, improving drainage, fertilization, etc.
5. Minimizing or eliminating man-caused disturbances. Logging, pipeline, sewerline, and powerline construction, or other construction activities require use of heavy equipment, which causes tree skinning and soil compaction and significantly weakens trees. Efforts to minimize the damaging consequences of these activities can significantly reduce the possibility of their leading to SPB problems.

PRECAUTIONARY PESTICIDE USE STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key--out of the reach of children and animals--away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honeybees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fungicides that you used for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary landfill dump, or crush and bury them in a level, isolated place.

NOTE: Some states have restrictions on the use of certain pesticides. Check your state and local regulations. Also, because registration of pesticides are under constant review by the U.S. Department of Agriculture, consult your county agricultural agent or state extension specialist to be sure the intended use is still registered.

REFERENCES CITED

- Bassett, R. and T. Gentry. 1982. Aerial detection survey of forest insect and disease activity, Sumter National Forest, South Carolina. USDA Forest Service, S&PF, FPM, Doraville, Ga. Report No. 82-3-4.
- Hoffard, W. H. and J. H. Ghent. 1979. Biological evaluation of southern pine beetle infestations on the Francis Marion-Sumter National Forests, South Carolina. USDA Forest Service, S&PF, FPM, Asheville, N.C. Report No. 79-1-42.

Forest Pest Management
Asheville Field Office

Report #83-1-6
October 1982

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